

FORM PTO-1390 (REV 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER <b>P56559PCT</b>
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (if known, see 37CFR 1.5) <b>09/890154</b>
INTERNATIONAL APPLICATION NO. PCT/CH99/00510	INTERNATIONAL FILING DATE 30 October 1999	PRIORITY DATE CLAIMED 27 January 1999	
TITLE OF INVENTION CLOSED INJECTION MOULDED CLOSURE			
APPLICANT(S) FOR DO/EO/US Creanova AG / Louis LAGLER, Rudolf RENTSCH			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<p>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input type="checkbox"/> This an express request to promptly begin national examination procedures 935 U.S.C. 371.</p> <p>4. <input checked="" type="checkbox"/> The U.S. has been elected by the expiration of 19 months from the priority date (PCT Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(3)). (<b>NOT executed</b>)</p> <p>10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36. (35 U.S.C. 371(c)(5))</p> <p><b>Items 11. to 16. below concern document(s) or information included:</b></p> <p>11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A FIRST preliminary amendment.</p> <p><input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information:</p> <p>Copies of: - International Preliminary Examination Report (PCT/IPEA/409)</p> <p>- PTO-1449</p>			

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <div style="font-size: 24pt; font-weight: bold; margin-top: 5px;">097/890154</div>		INTERNATIONAL APPLICATION NO. PCT/CH99/00510		ATTORNEY'S DOCKET NUMBER P56559PCT	
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17. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492(a) (a)-(5)):</b> Neither international preliminary examination fee (37 CFR 1.782) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1000.00</b> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... <b>\$860.00</b> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... <b>\$710.00</b> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... <b>\$690.00</b> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Articles 33(1)-(4) ..... <b>\$100.00</b> <div style="text-align: right; margin-top: 5px;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></div>				<b>CALCULATIONS PTO USE ONLY</b> <div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ <u>          </u>	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	10 -20=	<u>          </u>	X <b>\$18.00</b>	\$ <u>          </u>	
Independent claims	1 -3=	<u>          </u>	X <b>\$80.00</b>	\$ <u>          </u>	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)				X <b>\$270.00</b>	\$ 270.00
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1,270.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$ <u>          </u>	
<b>SUBTOTAL =</b>				\$ 1,270.00	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f))				\$ <u>          </u>	
<b>TOTAL NATIONAL FEE =</b>				\$ 1,270.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +				\$ <u>          </u>	
<b>TOTAL FEE ENCLOSED =</b>				\$ 1,270.00	
				Amount to be refunded	\$
				charged	\$

a. ☒ A check in the amount of \$ 1,270.00 to cover the above fees is enclosed (Check #39992)

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
 overpayment to Deposit Account No. **02-4943**. A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to  
 revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

Robert E. Bushnell  
 ROBERT E. BUSHNELL & LAW FIRM  
 1522 K Street, N.W.,  
 Suite 300  
 Washington, D.C. 20005-1202  
 Tel: (202) 638-5740  
 Fax: (202) 628-0755

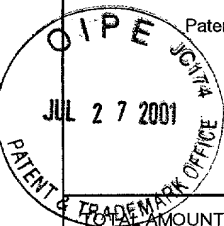
SIGNATURE

Robert E. Bushnell  
 NAME

27,774  
 REGISTRATION NUMBER

# FEE TRANSMITTAL

Patent fees are subject to annual revision.



Complete If Known	
Application Number	International application No.: PCT/CH99/00510
Filing Date	international Filing Date: 10/30/99
First Named Inventor	LOUIS LÄGLER et al.
Examiner Name	to be assigned
Group/Art Unit	to be assigned
Attorney Docket No.	P56559PCT

TOTAL AMOUNT OF PAYMENT (\$)1,270.00

## METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 02-4943  
Deposit Account Number: \_\_\_\_\_

☐ Charge Any Additional Fee Required Under 37 C.F.R. §1 16 and 1.17.

☐ Applicant claims small entity status. See 37 CFR 1 27

2. ☒ Payment Enclosed:  
(CHECK #39992)

☒ Check ☐ Credit Card ☐ Money Order ☐ Other

## FEE CALCULATION

### 1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
File Code	Fee (\$)	File Code	Fee (\$)		
101	710	201	355	Utility filing fee	\$
106	320	206	160	Design filing fee	\$
107	490	207	245	Plant filing fee	\$
108	710	208	355	Reissue filing fee	\$
114	150	214	75	Provisional filing fee	\$

SUBTOTAL (1) (\$).00

### 2. EXTRA CLAIM FEES

	Extra Claims	Fee from below	Fee Paid
Total claims	-20** =	x	=
Independent Claims	- 3** =	x	=
Multiple Dependent			=

\*\* or number previously paid, if greater, For Reissues, see below

### Large Entity Small Entity

File Code	Fee (\$)	File Code	Fee (\$)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim, if not paid
109	80	209	40	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$)0.00

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description	Fee Paid
105	1356t	205	65	Surcharge-late filing fee or oath	\$
127	50	227	25	Surcharge-late provisional filing fee or cover sheet	\$
139	130	139	130	Non-English specification	\$
147	2,520	147	2,520	For filing a request for reexamination	\$
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	\$
113	1,840 *	113	1,840*	Requesting publication of SIR after Examiner action	\$
115	110	215	55	Extension for reply within first month	\$
116	390	216	195	Extension for reply within second month	\$
117	890	217	445	Extension for reply within third month	\$
118	1,390	218	695	Extension for reply within fourth month	\$
128	1,890	228	945	Extension for reply within fifth month	\$
119	310	219	155	Notice of Appeal	\$
120	310	220	155	Filing a brief in support of an appeal	\$
121	270	221	135	Request for oral hearing	\$
138	1,510	138	1,510	Petition to institute a public use proceeding	\$
140	110	240	55	Petition to revive - unavoidable	\$
141	1,240	241	620	Petition to revive - unintentional	\$
142	1,240	242	620	Utility issue fee (or reissue)	\$
143	440	243	220	Design issue fee	\$
144	600	244	300	Plant issue fee	\$
122	130	122	130	Petitions to the Commissioner	\$
123	50	123	50	Petitions related to provisional applications	\$
126	240	126	240	Submission of Information Disclosure Statement	\$
581	40	581	40	Recording each patent assignment per property (Times number of properties)	\$
146	710	246	355	Filing a submission after final rejection (37 C.F.R. §1.129(a))	\$
149	710	249	355	For each additional invention to be examined (37 C.F.R. §1 129(b))	\$
Other Fee (specify) <u>960 Basic National Stage Fee</u>					\$1,000.00
Other Fee (specify) <u>968 Multiple dependent claims</u>					\$270.00

\*\* Reduced by Basic Filing Fee Paid  
SUBTOTAL (3) \$1,270.00

SUBMITTED BY		Complete (if applicable)	
Typed or Printed Name	Robert E. Bushnell, Esq.	Reg. Number	27,774
Signature	<i>Robert E. Bushnell</i>	Date	27 July 2001
		Deposit Account User ID	

REB/kf

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## Closed injection moulded closure

The present invention relates to a closed injection moulded closure according to the precharacterizing  
5 clause of independent Patent Claim 1.

The prior art discloses various plastics closures having snap-on hinges. To enable them to function, they must for technical reasons generally be produced  
10 in the open position. For cost reasons, however, attempts have been made to injection mould such closures in the closed state, especially to reduce the mould cost and the production costs, inter alia with avoidance of the so-called covering process.

15 Closed injection moulded closures are accordingly advantageous as they are cheaper, permit a simpler mould and furthermore offer the opportunity of integrating an original warranty seal without substantial additional cost. Examples of suitable  
20 original warranty seals are tear-off lips or weak points in the form of thin connecting webs. These tear-off lips or thin areas must be removed or deliberately destroyed on opening for the first time. Particularly in the case of foods, medicaments or  
25 products for infants, product safety is having to meet increasing legal requirements, which further increases the interest in corresponding closures having original warranty seals.

30 The prior art discloses individual one-part closed injection moulded closures which however are not convincing in their mode of operation. Mainly owing to too small an opening angle, a poor snap-on effect

and inadequate design as well as insufficient sealing, these closures have not become established on the market. In the opened position, the movable closure part is in such an unfavourable position that it constantly and unavoidably comes into contact with the contents and thus becomes soiled. Moreover, this closure part is so close to the pouring opening that it blocks said opening visually. From the point of view of injection moulding too, these closures are not without problems. Asymmetrical flow paths, an unfavourable arrangement of the film hinges and cooling problems are only a few of the problems. Owing to the system itself, these disadvantages cannot be overcome. In particular, the main hinge connections between the closure parts, which force the closure parts to form a rotational movement and limit the kinematics of closure are troublesome and particularly disadvantageous.

For example, EP 0 532 471 describes a closure which has the disadvantages described above. The lower closure part is connected to the movable upper closure part by means of a main hinge connection and two laterally arranged tension bands. The hinge connections and the tension bands must be arranged in such a way that they are on the one hand capable of being removed from the mould and are accessible from both sides (outside and inside). The unavoidable main hinge connection results in the closure parts having to be arranged very close together, with the correspondingly adverse effect on the opened state. The accessibility of the hinge region, which is essential for production, moreover means that the

tension bands cannot be designed in any desired manner and the angle between open and closed positions remains in the region of 80° or less. In addition, the upper closure part in the open position is in a poor, unstable and random arrangement relative to the spout. An insufficient snap-on effect and the absolutely unfavourable position of the upper closure part relative to the lower closure part in the opened position are obstacles to effective operation. Problems with the flow paths and poor design are further weaknesses. The main hinge connection moreover results in the closure parts moving along circular paths and therefore being subject to considerable restrictions with regard to the spatial arrangement.

The disadvantages described above cannot be overcome by means of the conventional closures which are known from the prior art.

It is therefore an object of the present invention to provide a closed injection moulded closure which does not have the disadvantages known from the prior art and which has a large, adjustable opening angle and a substantial snap-on effect. It is also an object of the present invention to provide a closure in which the movable closure part in the open position can be arranged so that it is away from the mouth region of the spout. In addition, the closure should, if desired, offer the possibility of being child-proof and secure during transport and should provide a good seal even in the case of contents with gas pressure.

This object is achieved by the invention defined in the Patent Claims.

The invention disclosed here avoids in advance the  
5     bottlenecks to which constructions according to the  
prior art are subject, by deliberately avoiding a  
main hinge connection between the closure parts. The  
movable closure part is positioned outside the zone  
of the spout or opening. Consequently, soiling of the  
10     movable closure part by the contents and visual and  
functional blocking are prevented. The snap-on effect  
is established and predetermined in a specific manner  
in line with the requirements. Owing to the absence  
of a main hinge, it is also possible for the first  
15     time to realize substantially symmetrical flow paths  
in the hinge region in the case of closed injection  
moulded closures. As a result of this, problems such  
as material backflow and cold welds do not occur.

20     Because the connection lacks a main hinge, it is  
furthermore achieved that the closure parts no longer  
move along circular paths relative to one another.  
The spatial trajectories instead correspond to  
adjustable movement paths which are adapted to the  
25     respective requirements. High spouts and other  
obstacles are overcome in a specific manner. The  
invention envisages that closed injection moulded  
closures can be produced with avoidance of the known  
disadvantages, with or without original warranty  
30     seals and with a good design. If desired in a  
specific case, child-proof properties and security  
during transport as well as particular sealing in the  
case of contents with gas pressure can be provided.

Embodiments of the invention are explained in more detail with reference to the following Figures:

5 Figure 1 schematically shows a closure according to  
the prior art;

Figure 2 schematically shows a closure according to the invention disclosed here;

10

Figure 3 shows a preferred embodiment of a closure according to the invention;

Figure 4 shows a closure according to Figure 3, in  
15 the open position;

Figure 5 shows a closed injection moulded closure with hinge connection arranged at the top.

Figure 1 shows a schematic side view of a closed injection moulded closure 1, as known from the prior art. A lower closure part 2 and a movable upper closure part 3 can be seen. The upper closure part 3 is connected to the lower closure part 2 by means of a conventional snap-on hinge 4. The snap-on hinge 4 consists of a main hinge connection 5 and two tension bands 6.1 and 6.2 (because of the direction of view, only the tension band 6.1 is visible here) which each connect the lower closure part 2 to the upper closure part 3 and as a rule are arranged by the side of the main hinge connection 5. Instead of tension bands 6.1, 6.2, there are also other known elements, such as toggle levers, etc., which are not used in



practice in closed injection moulded closures owing to various disadvantages. The main hinge connection 5 forms a direct hinge connection with only one hinge axis between the lower closure part 2 and the upper closure part 3. This hinge axis of the main hinge connection 5 is parallel to the direction of view in the representation shown here. Owing to the main hinge connection 5 having a hinge axis, all parts rotate relative to one another along circular paths.

10 In order to be able to produce the closure 1 in the closed position of the upper closure part 3, the main hinge connection 5 and tension bands 6.1, 6.2 and in particular their connections to the closure parts 2 and 3 must be arranged in such a way that they are

15 accessible in the injection mould (not shown) from the inside of the closure (arrow 10) and from the outside of the closure (arrow 11). Particularly the main hinge is difficult to form. Owing to these facts, the function (snap-on effect) and the

20 arrangement (open position) of the upper closure part in the case of the closures known from the prior art are very restricted and inadequate. A typical open position of the upper closure part 3 is represented by an upper closure part 7. The open position of the

25 tension bands 6 is represented by tension bands 8.1, 8.2 (only one can be seen). Owing to the unavoidable main hinge connection 5 in this closure concept, the closure 1 shown here has a small opening angle of about 80° and a poor snap-on effect.

30

Figure 2 schematically shows a closed injection moulded closure 20 according to the invention disclosed here. The closure 20 consists of a lower

closure part 21 and an upper closure part 22, which is shown here in the closed position in which it is also produced. According to the invention, the closure 20 shown here has (in contrast to the prior art) no main hinge connection (cf. Figure 1) between the closure parts 21 and 22. The closure parts 21 and 22 are instead actively connected to one another by two, preferably symmetrically formed, elements 23.1 and 23.2 (owing to the direction of view, only one element 23.1 is visible) and four hinge connections 24.1, 24.2, 25.1 and 25.2. Two hinge connections 24.1, 25.1 and 24.2, 25.2 each border an element 23.1 and 23.2, respectively, on non-adjacent sides and connect it to the closure parts 21 and 22, respectively. The hinge connections 24.1 and 25.1, and 24.2 and 25.2, respectively, make an angle  $\phi$  (cf. also Figure 3) with one another. The two planes defined by the hinge connections 24.1 and 25.1, and 24.2 and 25.2, respectively (not shown) in turn make an angle  $\omega$ . By varying the angles  $\omega$  and  $\phi$  and their ratio to one another, the snap-on effect and an opening angle  $\alpha$  of the closure are determined. The relationship between the opening angle  $\alpha$  and the angles  $\omega$  and  $\phi$  is given by the following formula:

$$\phi = 2 \cdot \arctan \left[ \frac{\sin(\alpha / 2)}{1 - \cos(\alpha / 2)} \cdot \sin(\omega / 2) \right]$$

To be able to produce the closure 20 in the closed position, the elements 23.1 and 23.2 and the hinge connections 24.1, 24.2, 25.1 and 25.2 are arranged in such a way that they are accessible in the mould from the inside of the closure (arrow 27) and from the

outside of the closure (arrow 28) and can be removed from the mould. For this purpose, the connecting elements 23.1, 23.2 and the associated hinge connections are arranged in a surface which is inclined relative to the closure axis. Preferably, hinges according to the patents EP 0 746 512, PCT/EP96/2780 or the Patent Application PCT/1999/00277 of the same Applicant are used for the closure, the contents of which are hereby incorporated by reference with regard to the details of the design of the hinges. Particularly in the case of closures having curved contours in which the connecting elements 23.1, 23.3 have a corresponding convexity or curvature owing to their contour integration, the hinge according to PCT/EP96/2780 is advantageous since the elastic strain of the long edge 46 (cf. Figure 3) under tension has the desired snap-on effect.

A typical open position of the upper closure part 22 is represented by an upper closure part 29. The corresponding open positions of the element 23.1 or 23.2 and of the hinge connection 25.1 or 25.2 are represented by an element 30.1 or 30.2 and a hinge connection 31.1 or 31.2. By avoiding a main hinge connection between the closure parts 21 and 22, it is possible to arrange the upper closure part 22 in its open position (upper closure part 29) in such a way that an optimal and, if required, predeterminable opening angle and an adjustable snap-on effect result. The predetermined opening angle is preferably in the range from 150° to 180° but may also be adapted to other requirements. On comparison of the

closures shown in Figure 1 (prior art) and Figure 2 (invention), the surprising importance of the invention disclosed here for closures produced in the closed state will become clear to the person skilled in the art.

Figure 3 shows an embodiment of a closure according to the invention in a perspective view. A lower closure part 21 and an upper closure part 22 can be seen. These are connected to one another by means of two elements 23.1 and 23.2 and four hinge connections 24.1, 24.2 and 25.1, 25.2, respectively, which border said elements. The hinge connections 24.1 and 25.1, and 24.2 and 25.2, respectively, each together define a plane 31 or 32, respectively, and make an angle  $\phi$  with one another. The edges 45 closer to the apex of the angle  $\phi$  are preferably substantially pressure-resistant. The planes 31 and 32 in turn make a solid angle  $\omega$  with one another. The planes 31 and 32 are inclined relative to the closure axis in such a way that they are further away from the closure axis in the region of the lower connection (lower closure part 21) than in the region of the upper connection (upper closure part 22). This permits demouldability of the closure while also making it possible to form the desired hinge. In the embodiment shown, the connecting elements 23.1, 23.2 are integrated into a convex outer contour of the closure, with a correspondingly acute angle  $\omega$  ( $< 180^\circ$ ) between the planes 31 and 32. In other embodiments having a concave outer contour, an obtuse angle ( $> 180^\circ$ ) is enclosed between the two planes 31, 32. The hinge connections 24.1, 24.2 and 25.1, 25.2

are preferably film hinges as known from the prior art. The desired bending ranges can however also be different. In the closed position shown here, the closure 20 is preferably produced by means of injection moulding. The closure parts 21, 22 and 23.1, 23.2 and the hinge connections 24.1, 24.2, 25.1, 25.2 are functionally separated from one another here by all-round gaps 33 to 38 so that the movable upper closure part 22 can assume at least two spatially defined and stable positions relative to the lower closure part 21. There are unstable states (dead points) between these stable positions so that the upper closure part 22 automatically attempts to achieve the nearest stable position and hence has a snap-on effect. In certain stable positions, in particular in the closed position of the closure 20 shown here, the closure parts 21, 22, 23.1, 23.2, 24.1, 24.2, 25.1, 25.2 are in substantially stress-free states (geometric deformations). In addition to these stress-free, stable positions, non-stress-free stable positions are also possible. In these positions, the elements 23.1 and 23.2 and the hinge connections 24.1, 24.2, 25.1, 25.2 are typically under a torsional stress and the secondary stresses caused thereby. The elements 23.1 and 23.2 are formed along a shorter free edge 45.1 or 45.2 in such a way that they do not buckle under the pressures occurring. The longer free edges 46.1 and 46.2 are preferably designed in such a way that they lengthen elastically and reversibly under the tensile stresses occurring. This can be achieved, for example, by a three-dimensional curvature or specific choice of material. The closure parts 21 and 22 advantageously

have a certain elasticity so that, if required, they undergo reversible elastic deformation under the loads occurring. The elements 23.1 and 23.2 are advantageously formed in such a way that they deform in a controlled manner owing to the torsional forces occurring. The coordination between the closure parts 21 and 22 is adjustable through the torsional rigidity of the elements 23.1, 23.2. The desired snap-on effect can thus be achieved by the closure parts or by the connecting elements individually or in combination with one another. Owing to the low torsional rigidity of the elements 23.1 and 23.2, it is possible to achieve intermediate states in which the closure parts are stable relative to one another but do not assume tension-free positions. Closures having a plurality of open positions can thus be realized.

The closure parts are separated from one another by the gaps 33 to 38 so that the closure 20 can be opened and closed. The gaps 33 to 38 are formed in such a way that they are optimally accessible in the mould and can be removed from the mould. Elements 39 are present in the gap 33 of the embodiment shown here. Said elements additionally connect the closure parts 21 and 22. The elements 39 are designed in such a way that, if required, they serve as predetermined breaking points which are destroyed when the closure is first opened. The elements 39 may also be in the form of all-round, membrane-like predetermined breaking points which enclose one or more desired sectors. A consumer can thus recognize whether the closure has already been opened before purchase

(original warranty seal). The elements 39 also serve for preventing unintentional opening during transport, since a greater force has to be overcome on opening for the first time. In addition to the

5 above-mentioned points, the elements 39 also serve as flow aids in the production of the closure 20, in order to achieve better filling of the mould. Instead of elements 39, other equivalent means (not shown) are also possible, for example in the form of tear-

10 off lips, which have to be removed before opening for the first time, for example by tearing off. Integrations of further functions are not hindered. The course of the gaps 33 to 38 can be substantially freely chosen provided that there is no impairment of

15 the mode of operation of the closure and the producibility. The elements 23.1 and 23.2 are preferably integrated into the outer contour of the closure parts 21 and 22. In the invention disclosed here, the design is subject to few limits, in

20 contrast to the prior art. Here, the elements 23.1 and 23.2 are adapted to the outer contour of the closure and are integrated therein. Of course, they may also have another design or may be flat. If required, they may have a connection to one another.

25 An advantageous connection can be realized, for example, in the form of a further (straight) hinged connection, in the form of a film hinge in the case of plastics.

30 Figure 4 shows the closure 20 according to Figure 3 in the opened position, in a perspective sectional view. Here, the closure 20 is pressed onto a bottle 50 and thereby fastened. Here, the upper closure part

22 is present in a stable open position swivelled 180° backwards so that a pouring opening 51 for pouring out the content contained in the bottle 50 is unobstructed. In the embodiment shown here, upper closure part 22 is present in an oblique position above the lower closure part 21 so that it does not hinder pouring and the spout 51 is visually not concealed. Because the main hinge connection has been avoided according to the invention and owing to the length of the connecting elements 23.1, 23.2, it is possible to bring the upper closure part 22 into this position in a closed injection moulded closure 20. In the case of the closures known from the prior art, an upper closure part generally hinders pouring. The elements 39 were destroyed here on deliberately opening the closure 20. Residues of the elements 39 are therefore present both on the lower closure part 21 and on the upper closure part 22. It is thus safely indicated to a user that the closure 20 was opened at least once. The closure parts 21, 22, 23.1, 23.2, 24.1, 24.2, 25.1, 25.2 are advantageously substantially tension-free in the open position of the closure 20 shown here. This means that the closure parts 21, 22, 23.1, 23.2 (except for the hinge connections 24.1, 24.2, 25.1, 25.2) are not subject to any deformations. In the interior of the closure 23, preferably in the region of the elements 23.1 and 23.2, means 52 for partial stiffening of the closure parts 21, 22, 23.1, 23.2 are present on the closure parts 21, 22, 23.1, 23.2. The snap-on behaviour and the functionality of the closure 20 are thus influenced in a controlled manner. Means 52 used for stiffening the closure parts are preferably ribs,



thicker regions or other, equivalent means.

A tubular element 53 which in this case has an edge 55 thickened by means of a bead 54 is evident in the interior of the upper closure part 22. The element 53 or the bead 54 corresponds, in a closed position of the closure 20, to the spout 51 of the bottle 50 or of an adapter between bottle and closure so that said bottle is sealed. The element 53, the bead 54 and the spout 51 actively connected to them in the closed position of the closure 20 are advantageously designed in such a way that the sealing effect is adjusted proportionally to the internal pressure of the bottle 50. This can be achieved, for example, through the geometry of the tubular element 53 if the edge 55 or the bead 54 expands proportionally to the internal pressure and to a greater extent than the increase in the diameter of the spout 51. Consequently, the edge 55 is pressed to a greater extent against the inner wall 56 of the spout 51 with increasing internal pressure, with the result that the sealing effect is enhanced. Active element 57 is present on the inside of the upper closure part 22. In the closed position of the closure 20, this active element 57 has an active connection to a counter-element, in this case an outer edge 58 of the bottle 50, by virtue of the fact that it grips under said counter-element and thus prevents unintentional opening of the closure 20, for example during transportation or in the case of high internal pressures. This locking mechanism can be temporarily released here by lateral pressure on the upper closure part 22 in the direction of the arrows 59 and

60. As a result of the lateral pressure, the upper closure part is deformed in such a way that the catch 57 moves in the direction of an arrow 61 and the active connection with the outer edge 58 is temporarily broken. The closure 20 can thus be opened. The locking mechanism shown here is also particularly suitable for combination with a quality seal or original warranty seal in the form of a tear-off lip (not shown). Of course, it is also possible to use more than one catch 57 or to position said catch otherwise. The effective ranges of the pressures must be appropriately adjusted. Thus, the closure according to the invention can be used even in the case of high internal pressures.

15 Figure 5 shows another embodiment of a closure 1 which is mounted on, preferably forced onto, a container 12. The closure comprises a first, fixed closure part 62 and a second, movable closure part 20 63. The container 12 may have, in the region of its upper end 67, a complete opening which substantially extends over its total cross-section, or, in the region of the movable closure part 63, by a smaller opening which appears as soon as the movable closure part 63 opens. Arranged in the region of the transition 68 between the two closure parts are two connecting elements 23.1, 23.2, which form the hinge connection between the two closure parts. In contrast to the closures described above, the connecting elements are arranged not by the side of the closure in an inclined surface but on the top of the closure (relative to the closure axis). The geometry of the 30 two connecting elements 23.1, 23.2 is preferably

designed so that the movable closure part performs a snap-on movement of about 90° or 180°, the formula mentioned above in association with Figure 2 being used to obtain the desired opening angle  $\alpha$ . Of course, it is also possible to obtain other intermediate angles by corresponding modification of the hinge connections 24.1, 25.1 and 24.2, 25.2. The avoidance, according to the invention, of a main hinge in combination with the mutual arrangement of the closure parts permits such a closure having a large opening angle  $\alpha$ .

The external geometry of the closure can have a convex shape, as shown here. However, closures in which the connecting elements are arranged in a depression or in which the external geometry is substantially concave can also be realized. The arrangement of the hinge connections in the upper region of the closure permits particularly advantageous hinges and predetermined breaking points for achieving an original warranty seal if, for example, the transition 68 between the two closure parts 62, 63 is not continuously separated but contains connections or connecting regions which have predetermined breaking points and are parted only on opening for the first time. According to the invention, it is possible to integrate the connecting elements 23.1, 23.2 completely into the closure contour so that a large number of closure designs are possible. For example, the movable closure part can be made smaller and can be surrounded by the fixed closure part so that, as a result of opening the movable closure part, an opening in the closure

itself is achieved and the container is not opened along its upper edge (press-on bead, weld, etc.), in contrast to the situation in the examples shown in this figure. Such a design of the movable closure part is particularly advantageous when it is necessary to provide an original warranty seal where the lid part and container may not be detachable from one another at any point.

- 10 In particular embodiments, it is possible to provide more than two connecting elements 23.1, 23.2, and the arrangement of the further connecting elements should support the kinematics of the closure. The connecting elements can permit additional hinge movements, in  
15 accordance with solutions according to EP 0 746 512.

## PATENT CLAIMS

1. Closed injection moulded closure (20) having a first closure part (21, 62), a second closure part (22, 63) and a hinge connection actively connecting them, characterized in that the closure parts (21, 22, 62, 63) have no main hinge connection between them and that the closure parts (21, 22, 62, 63) are connected to one another by at least two connecting elements (23.1, 23.2) via two hinge connections (24.1, 24.2, 25.1, 25.2) each bordering said connecting elements on nonadjacent sides, two hinge connections (24.1, 25.1, 24.2, 25.2) each bordering a connecting element (23.1, 23.2) making an angle ( $\phi$ ) with one another and planes (31, 32), defined by two hinge connections (24.1, 25.1, 24.2, 25.2) each bordering a connecting element (23.1, 23.2), making an angle ( $\omega$ ) with one another.
2. Closed injection moulded plastics closure (20) according to Patent Claim 1, characterized in that the movable closure part (22) has at least two stable positions relative to the fixed closure (21).
3. Closed injection moulded plastics closure (20) according to Patent Claim 2, characterized in that the closure parts (21, 22, 23.1, 23.2, 62, 63) in the open state have no geometric deformation relative to the injection moulded state.

4. Closed injection moulded plastics closure (20) according to any of Patent Claims 1 to 3, characterized in that the closure parts (21, 22, 23.1, 23.2, 62, 63) are functionally separated from one another by gaps (33 to 38).
5. Closed injection moulded plastics closure (20) according to Patent Claim 4, characterized in that at least one of the gaps (33 to 38, 68) has elements (39) which connect the closure parts (21, 22, 23.1, 23.2, 62, 63) to one another and which are destroyed when the closure (20) is opened for the first time.
6. Closed injection moulded plastics closure (20) according to any of Patent Claims 1 to 5, characterized in that the closure parts (21, 22, 23.1, 23.2, 62, 63) are connected to one another by a tear-off lip which is removed before opening for the first time.
7. Closed injection moulded plastics closure (20) according to any of Patent Claims 1 to 6, characterized in that the first closure part (22, 62) has an active element (57) which, in the closed position of the closure (20), has an active connection to a counter-element (58) and prevents unintentional opening of the closure (1, 20).
8. Closed injection moulded plastics closure (20) according to Patent Claim 7, characterized in

that the closure (20) is opened by lateral pressure on the first closure part (22, 62).

- 5 9. Closed injection moulded plastics closure (20) according to any of the preceding Patent Claims, characterized in that the relationship between an opening angle ( $\alpha$ ) of the closure (20) and the angles ( $\omega$ ) and ( $\phi$ ) is given by the following formula:  $\phi = 2 \cdot \arctan \left[ \frac{\sin(\alpha / 2)}{1 - \cos(\alpha / 2)} \cdot \sin(\omega / 2) \right]$ .

10

10. Closed injection moulded plastics closure according to any of the preceding Claims, characterized in that the first closure part (62) is adjacent to the second closure part (63) and both closure parts (62, 63) are actively connected to a container (12), at least one closure part (63) being detachably and actively connected to the latter.

- 15 20 11. Closed injection moulded plastics closure according to any of the preceding Claims, characterized in that the connecting elements (23.1, 23.2) are arranged in a concave region of the closure contour.

(54) Title: CLOSED INJECTION MOULDED CLOSURE

(57) Abstract

The invention relates to a closed injection moulded plastics closure (20) having a first closure part (21) and a second closure part (22). The first closure part (21) is connected to the second closure part (22) by means of a snap-on hinged connection. The closure parts (21, 22) have no main hinged connection with each other but are connected to one another by means of two elements (23.1, 23.2) and in each case two hinged connections (24.1, 24.2, 25.1, 25.2) bordering these elements (23.1, 23.2) on non-adjacent sides. Elements (39) serve as an original warranty seal for indicating opening for the first time. If required, an active element (57) and a counter-element (58) serve as a locking mechanism and prevent unintentional opening of the closure (20).

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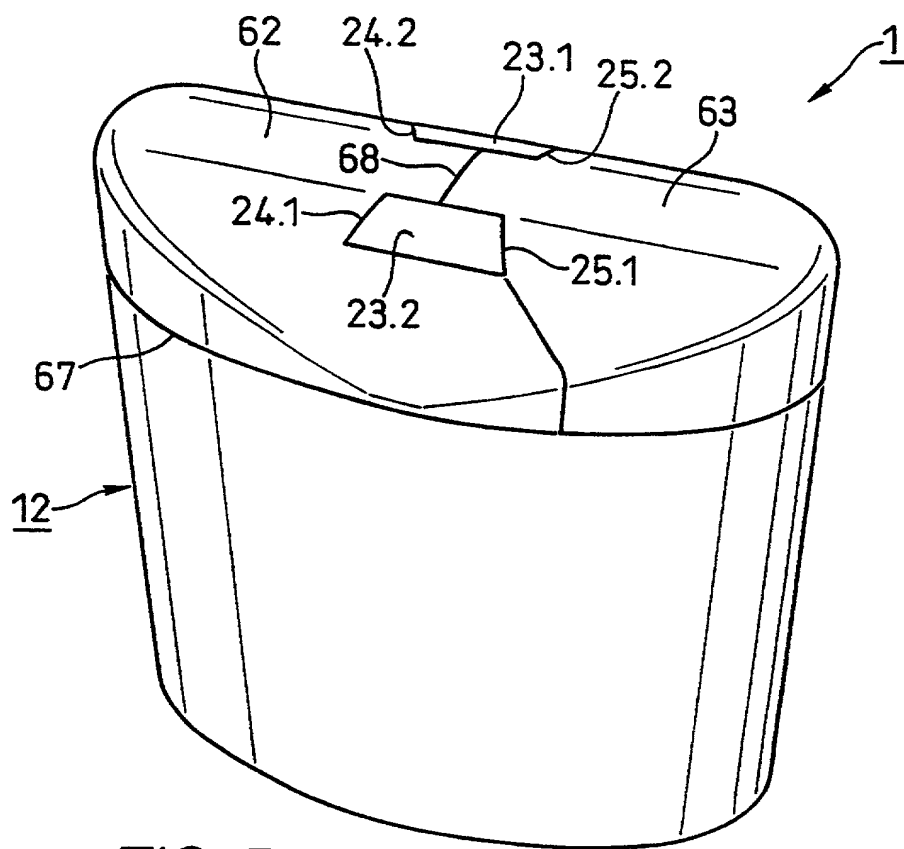


FIG. 5

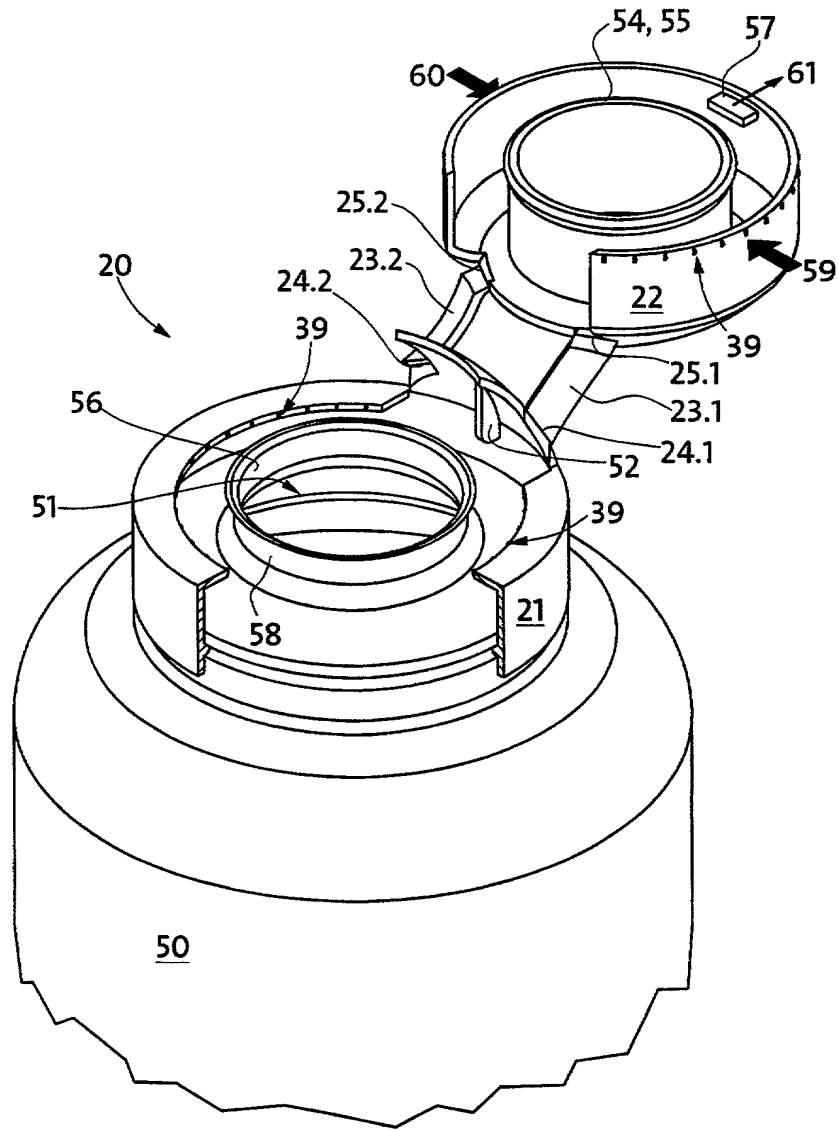


Fig. 4

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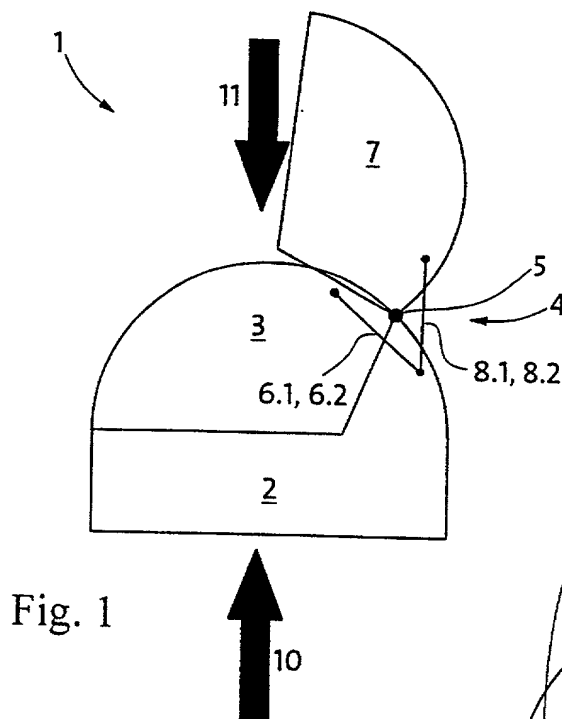


Fig. 2

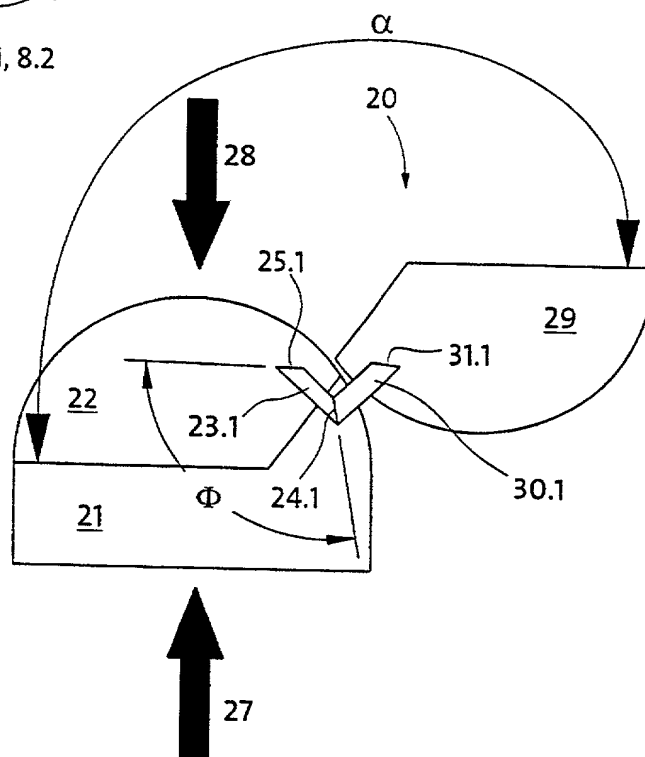
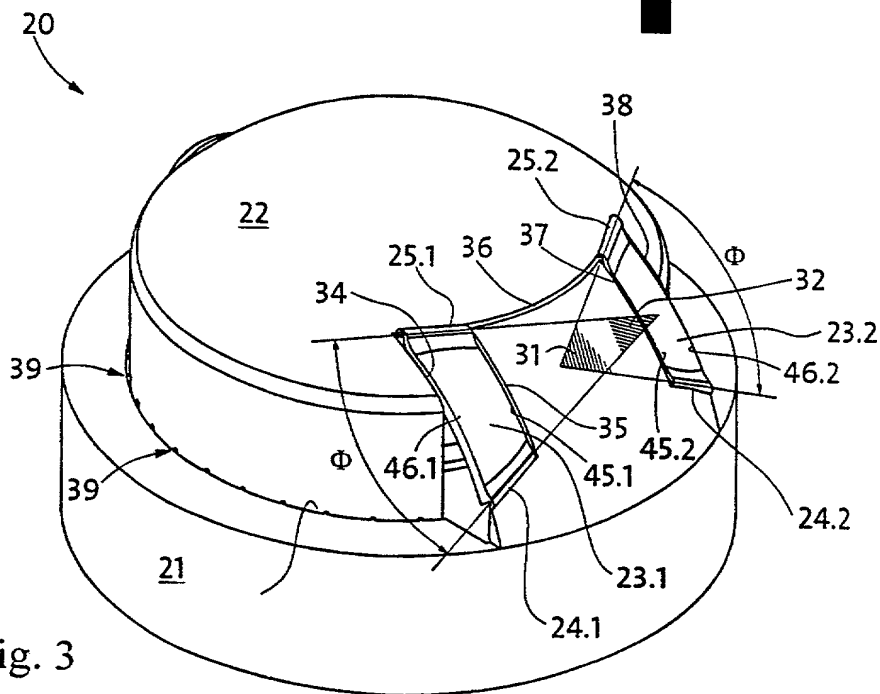


Fig. 3



AS A BELOW NAMED INVENTOR, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe that I am the original, first and sole (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below), of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE: **CLOSED INJECTION MOULDED CLOSURE**

the specification of which either is attached hereto or otherwise accompanies this Declaration, or:

☐ was filed in the U.S. Patent & Trademark Office on \_\_\_\_\_ and assigned Serial No. \_\_\_\_\_

☐ and (if applicable) was amended on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability and to the examination of this application in accordance with Title 37 of the Code of Federal Regulations §1.56. I hereby claim foreign priority benefits under Title 35, U.S. Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, or §119(e) of any United States provisional application(s), listed below and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PCT/CH99/00510 (Application Number)	SWITZERLAND (Country)	30 October 1999 (Day/Month/Year filed)	Priority Claimed: Yes [ X ] No [ ]
PCT/IB99/00277 (Application Number)	WIPO (Country)	27 January 1999 (Day/Month/Year filed)	Yes [ X ] No [ ]

I hereby claim the benefit under Title 35, U.S. Code, §120, of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, U.S. Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, The Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (Filing Date) (STATUS: patented, pending, abandoned)

(Application Serial No.) (Filing Date) (STATUS: patented, pending, abandoned)

I hereby revoke all previously granted powers of attorney and appoint the following attorneys: Robert E. Bushnell, Reg. No. 27,774, Michael D. Parker, Reg. No. 34,973, and Darren R. Crew, Reg. No. 37,806, to prosecute this application and to transact all business in the U.S. Patent & Trademark Office connected herewith and with any divisional, continuation, continuation-in-part, reissue or re-examination application, with full power of appointment and with full power to substitute an associate attorney or agent, and to receive all patents which may issue thereon, and request that all correspondence be addressed to:

Robert E. Bushnell,  
Attorney-at-Law  
Suite 300, 1522 "K" Street, N.W.  
Washington, D.C. 20005-1202

Payor No. 008439  
Area Code: 202-408-9040

HEREBY DECLARE that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 U.S. Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF FIRST OR SOLE INVENTOR: LOUIS LAGLER

Citizenship: Switzerland

Inventor's signature: \_\_\_\_\_

Date: 10/12/01  
CHX

Residence & Post Office Address: Nürnbergstrasse 25, CH-8037 Zürich, Switzerland

FULL NAME OF SECOND JOINT INVENTOR: RUDOLF RENTSCH

Citizenship: Switzerland

Inventor's signature: \_\_\_\_\_

Date: 10/15/01  
CHX

Residence & Post Office Address: Pfannenstielstrasse 11, CH-8706, Meilen, Switzerland

FULL NAME OF THIRD JOINT INVENTOR: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Inventor's signature: \_\_\_\_\_

Date: \_\_\_\_\_

Residence & Post Office Address: \_\_\_\_\_

FULL NAME OF FOURTH JOINT INVENTOR: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Inventor's signature: \_\_\_\_\_

Date: \_\_\_\_\_

Residence & Post Office Address: \_\_\_\_\_

☐ Additional inventors are being named on separately numbered sheets attached hereto.

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filed: 27 July 2001